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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/721,080	11/26/2003	Hiroyuki Ohta	032117	7846

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EXAMINER

TRAN, LONG K

ART UNIT	PAPER NUMBER
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2818

DATE MAILED: 08/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/721,080	<b>Applicant(s)</b> OHTA, HIROYUKI	
	<b>Examiner</b> Long K. Tran	<b>Art Unit</b> 2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 22 May 2006.  
2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 15-19, 25 and 26 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☒ Claim(s) 15-19 and 26 is/are allowed.  
6) ☒ Claim(s) 25 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.  
10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### *Response to Amendment*

1. This office action is in response to Amendment filed on 05/22/2006.
2. Claims **1 – 14** and **20 – 24** have been cancelled.
3. Claims **15** and **18** have been amended.
4. Claims **25** and **26** have been added.
5. Claims **15 – 19, 25** and **26** are presented for examination.

### *Claim Rejections - 35 USC § 103*

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims **15 – 19** are rejected under 35 U.S.C. 103(a) as being unpatentable over Ahn Dong Hul (Japan Publication No. 2002-203895) in view of remarks.

8. Regarding claim **25**, Ahn Dong Hul, figures 1 – 10, discloses a semiconductor device comprising:

a semiconductor substrate (100);

an isolation trench (21) formed under a surface of said semiconductor substrate (100);

a liner of a silicon nitride film ((107); [0025]) covering a lower inner surface of said isolation trench, wherein said liner of a silicon nitride film is retracted below the surface of said semiconductor substrate ([0026] – [0028]);

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a first silicon oxide film (119,129) ([0032], [0034]) formed in a region surrounded by said liner of the silicon nitride film and burying a lower region of said isolation trench;

a second silicon oxide film ((139,149); [0034], [0037]) formed on said first silicon oxide film and burying an upper region of said isolation trench; and active regions defined by said isolation trench.

Ahn Dong Hul does not teach the silicon nitride film (SiN) is retracted below the surface of the semiconductor substrate by 80 nm to 150 nm.

However, it would have been well known in the art that the selection of those parameters such as **energy, concentration, temperature, time, molar fraction, depth, width, thickness, etc.**, would have been obvious and involve routine optimization which has been held to be within the level of ordinary skill in the art.

"Normally, it is to be expected that a change in **energy, concentration, temperature, time, molar fraction, depth, width, thickness, etc., or in combination of the parameters** would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art ... such ranges are termed "critical ranges and the applicant has the burden of proving such criticality.... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."

Furthermore, the retracted size of the SiN film is indeed a matter of design and is not connected to critical results. Specially, in order to have a largest drain current,

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considered critical by the Applicant, the thickness of the SiN film has to be 100nm, the gate voltage has to be 1.21V, and the drain voltage has to be 0.01V. . Therefore, a retracted size alone is not critical, and is fairly considered obvious.

***Allowable Subject Matter***

9. Claims **15 – 19** and **26** are allowed.

10. The following is an examiner's statement of reasons for allowance: Claims **15 – 19** and **26** are allowable over the prior art of record because none of the prior art whether taken singularly or in combination, especially when these limitations are considered within the specific combination claimed, to teach:

A semiconductor device having a liner of silicon nitride film, formed in a trench, being retracted below the surface and in direct contact (no layer(s) being in between) with both first silicon oxide film and second silicon oxide film as cited in the independent claim 1; a semiconductor device having a liner of silicon nitride film, formed in a trench, being retracted below the surface and a second silicon oxide film extends over a corner to an upper surface of an active region as cited in claim 26; and among other limitations as cited in the independent claims 1 and 6.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Long K. Tran whose telephone number is 571-272-1797. The examiner can normally be reached on Mon-Thu.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MinSun Harvey or Matthew Smith can be reached on 571-272-1835 or 571-272-1907 (Smith). The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

LKT



August 4, 2006